Claims

What is claimed is:

Sub a1

1. A method of controlling return path ingress comprising the steps of:
   (a) detecting the presence of return path ingress in the return frequency band; and
   (b) mitigating the return path ingress substantially near the subscriber location.

2. The method described in claim 1 wherein the detecting of step (a) occurs at the head-end.

3. The method described in claim 1 wherein the detecting of step (a) occurs substantially near the subscriber location.

4. The method described in claim 1 wherein the detecting of step (a) utilizes ingress measurements extending across the return frequency band.

5. The method described in claim 1 wherein the detecting of step (a) takes place in a sub-band of the return frequency band.

6. The method described in claim 1 wherein the detecting of step (a) takes place in an active sub-band of the return frequency band.

7. The method described in claim 1 wherein the detecting of step (a) takes place in an inactive sub-band of the return frequency band.

8. The method described in claim 1 wherein the detecting of step (a) further comprises the steps of:
   (i) measuring an average return path signal power in the return frequency band;
   (ii) comparing the average return path signal power to a detection threshold; and
   (iii) determining the presence of ingress in the return frequency band based on the result of the comparison.

9. The method described in claim 8 further characterized in that the ingress is declared present when the average power exceeds the detection threshold.

10. The method described in claim 1 wherein the mitigating of step (a) is accomplished by attenuating the return path signal.

11. The method of claim 10 wherein the attenuation is performed based on a power-level equalization algorithm.

12. The method described in claim 1 wherein the mitigating of step (a) is accomplished by isolating the return path signal.

13. In a cable network environment having a head-end and a subscriber location with return path communications being accomplished in a return frequency band, a method of detecting and mitigating return path ingress, the method comprising the steps of:
    (a) retrieving information on channel usage to distinguish active sub-bands from inactive sub-bands;
    (b) detecting the presence of ingress in inactive sub-bands of the return path; and
    (c) mitigating the return path ingress at a location near the subscriber location.

14. The method described in claim 13 wherein the information on channel usage is retrieved from the head-end.

15. The method described in claim 13 wherein channel usage is detected automatically at a location substantially near the subscriber location.

16. In a cable network environment having a head-end and a subscriber location with return path communications being accomplished in a return frequency band, a method of detecting and mitigating return path ingress, the method comprising the steps of:
    (a) retrieving information on channel usage to distinguish active sub-bands from inactive sub-bands;
    (b) detecting the presence of ingress in active sub-bands of the return path; and
    (c) mitigating the return path ingress at a location near the subscriber location.

17. The method described in claim 16 wherein the information on channel usage is retrieved from the head-end.

18. The method described in claim 16 wherein channel usage is detected automatically at a location substantially near the subscriber location.

19. The method of claim 18 wherein the automated detection of channel usage comprises the steps of:

(i) estimating a power spectrum density (PSD) of a return path signal;

(ii) correlating the PSD with a set of stored PSDs;

(iii) determining a frequency at peak correlation; and

(iv) determining a frequency band in use.

20. The method described in claim 16 wherein the active band is in use by an in-home device.

21. The method described in claim 16 wherein the active band is in use by a communications gateway.

22. In a cable network environment having a head-end and a subscriber location with return path communications being accomplished in a return frequency band, a method of preventing in-home signals from entering an active sub-band of the return path at a location near the subscriber location, the method comprising the steps of:

(a) determining the active sub-band wherein the active sub-band is in use by a device located near the subscriber location;

(b) monitoring an in-home signal present in the active sub-band; and

(c) isolating the in-home signal when the in-home signal is above a predetermined threshold.

23. In a cable network environment having a head-end and a subscriber location with return path communications being accomplished in a return frequency band, a method of detecting channel usage at a location near the subscriber location, the method comprising the steps of:

(a) estimating the spectrum of an in-home signal;

(b) correlating the spectrum with a set of stored spectra; and

(c) determining a frequency band in use by an in-home device from the result of the correlation.

24. A communications gateway for use in a two-way cable environment wherein the communications gateway is capable of reducing return path ingress, the communications gateway comprising:

(a) a network side cable connection for transmitting a return path signal onto a cable network;

(b) a subscriber side cable connection for receiving the return path signal;

(c) an attenuating element for reducing the power in the return path signal which is subsequently coupled to the network side cable connection;

(d) a control unit for enabling the attenuating element.

25. The communications gateway of claim 24, wherein the attenuating element is a switch.

26. The communications gateway of claim 24, wherein the attenuating element is a notch filter.

27. The communications gateway of claim 24, wherein the attenuating element is an active amplifier.

28. The communications gateway of claim 24, wherein the control unit runs a power-level equalization to control the attenuation value of the attenuating element.

29. A communications gateway for use in a two-way cable environment wherein the communications gateway is capable of reducing return path ingress, the communications gateway comprising:

(a) a network side cable connection for transmitting a return path signal onto a cable network;

(b) a subscriber side cable connection for receiving the return path signal;

(c) a Radio Frequency (RF) module connected to the network side cable connection and to the subscriber side cable connection, wherein the RF module further comprises;

(i) a tap for separating a portion of the power from the return path signal received through the subscriber side cable connection;

(ii) an attenuating element for reducing the power in the return path signal which is subsequently coupled to the network side cable connection;

(d) a control unit for enabling the attenuating element.

30. The communications gateway of claim 29, wherein the Radio Frequency module further comprises:

(iii) a downstream directional coupler for directing the downstream signal contained in the return path frequency band to the control unit;

31. The communications gateway of claim 29, wherein the attenuating element is a switch.

32. The communications gateway of claim 29, wherein the attenuating element is a notch filter.

33. The communications gateway of claim 29, wherein the attenuating element is an active amplifier.

34. The communications gateway of claim 29, wherein the control unit runs a power-level equalization algorithm to control the attenuation value of the attenuating element.

35. The communications gateway of claim 29, wherein the control unit of element (d) further comprises:

(i) an acquisition stage coupled to the tap and receiving a return path monitoring signal created by the tap;

(ii) a power estimation circuit for measuring the power in the return path monitoring signal;

(iii) a decision circuit for determining if the return path monitoring signal exceeds a predetermined threshold.

36. The communications gateway of claim 29, wherein the control unit of element (d) further comprises:

(i) an acquisition stage coupled to the tap and receiving a return path monitoring signal created by the tap;

(ii) an analog to digital conversion circuit for digitizing the return path monitoring signal;

(iii) a digital signal processing unit for determining the return path monitoring signal power;

(iv) a decision circuit for determining if the RF signal exceeds a predetermined threshold.

37. The communications gateway of claim 29, wherein the control unit of element (d) further comprises:

(i) an acquisition stage coupled to the tap and receiving a return path monitoring signal created by the tap;

(ii) a filtering stage for receiving a sub-band of a return path frequency spectrum and creating a filtered return path monitoring signal;

(iii) a power estimation circuit for measuring the power in the filtered return path monitoring signal; and

(iv) a decision circuit for determining if the filtered return path monitoring signal exceeds a predetermined threshold.